REMARKS

Claims 1, 5, and 7 are currently pending in this application, as amended. Only amendments as to form have been made to claim 1. Accordingly, no new matter has been added.

Claim Rejections Under 35 U.S.C. § 102(b)

Claims 1, 5 and 7 have been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,422,140 ("Keats"). It is the Examiner's position that Keats discloses a plant protection system in a nuclear power plant including a test generating computer (TGC) for generating a test input for self-diagnosis, a trip algorithm computer (TAC) for receiving the safety parameters via a plurality of measuring channels which are physically and electrically isolated from each other, a voting algorithm computer (VAC) for receiving a trip state of each safety parameter, and a pattern recognition computer (PRC) for expecting a signal pattern to be input from the VAC based on the test input signal. The Examiner further asserts that the test input of Keats is inserted between actual safety parameters as a test parameter and that Keats discloses a test signal position bit indicating position information of the test input.

The Applicants respectfully traverse the Examiner's characterization of Keats and the rejection of claims 1, 5 and 7 for at least the following reasons.

Present Invention

The present invention is directed to a digital online active test-plant protection system (DOAT-PPS) in a nuclear power plant. The DOAT-PPS includes a test generating computer (TGC) that generates a test input for self-diagnosis. The test input is inserted between actual safety parameters during normal operation as a test parameter and a test signal position bit indicates position information of the test input, and therefore, testing occurs during actual operation. The DOAT-PPS also includes a trip algorithm computer (TAC) that receives the safety parameters through the TGC from a plurality of measuring channels which are physically and electrically isolated from each other and then compares the safety parameters and predetermined limit values of the safety parameters to determine a trip state of the safety parameter, if there is a test input by the TGC. The DOAT-PPS also includes a voting algorithm computer (VAC) that

receives a trip state of each of the safety parameters determined by the TAC in each of the channels, determines a final state of each of the safety parameters and then outputs the result. The DOAT-PPS further includes a pattern recognition computer (PRC) that expects a signal pattern to be input from the VAC by using the test signal position bit which is input through the VAC from the TGC, compares the signal pattern on a one to one basis with the result determined by the VAC and then if the signal pattern and the result are not consistent, determines to trip the reactor.

Thus, according to the present invention, each TGC generates a test input and only inserts the same test input between actual safety parameters as a test parameter. When an abnormal parameter (test input) is received in the (reactor) protection system, the parameter can be detected accurately. Further, it is possible to monitor the state of all the components as well as all types of errors.

Keats

Keats discloses a monitoring means for a nuclear reactor, wherein thermocouples are utilized to determine the temperature of parts of the reactor. Keats teaches that reactor safety practice requires that replicated sensor channels are segregated so that replicated thermocouples in any group must each be handled by a separate multiplexer and telemetry link (i.e., redundant path). Therefore, according to Keats, there are at least as many multiplexers and telemetry links as there are thermocouples per group.

FIG. 2 shows a one hundred and twenty-eight (128) input multiplexer in which the cyclically progressive pattern is formed from sixteen (16) groups, each of eight (8) inputs. Each group comprises six (6) transducer inputs (thermocouples) and two (2) interleaved test inputs (i.e., the test inputs are hardwired inputs into the multiplexers – see e.g., col. 1, lines 29-45 and col. 4, lines 2-26). Each multiplexer 8 has eight inputs and receives two of these as test inputs. One test input is provided by the thermocouple cold junction temperature measurement and the other test input is provided by a high temperature reference signal, which signal is a signal outside the range of signals which can be permissibly received from the thermocouples (col. 4, lines 2-8). Thus, both test inputs are wired signals that are received by the multiplexers and not generated by the computer.

A polarity reversing switch follows the multiplexer. The switch changes state on completion of every cycle of the multiplexer and causes the polarity of the input data stored in the memory of the processor to be reversed each time it is refreshed. The processor is arranged to anticipate this regular reversal of polarity and if it fails to occur because of a failure of the multiplexer to refresh the memory, an incorrect status bit pattern can be generated and recognized. Provision of a polarity reverser exercises the common data path on each multiplexer cycle in order to reveal faults which restrict its range of movement. In a simpler arrangement, polarity of the test inputs can be reversed only on each cycle of a multiplexer arrangement including a group of multiplexers.

Thus, Keats teaches a dynamic safety system (DSS) that uses a multiplexer which receives (hardwired) test signals and multiplexes those test signals along with other received input signals. Therefore, Keats can only detect an abnormal signal and cannot identify *which* component is "abnormal." Keats fails to disclose a test generating computer that generates a test input for self-diagnosis. Thus, Keats cannot monitor all of the components of the protection system. Furthermore, Keats teaches a fixed test input algorithm (signal and wired pattern), i.e., the test signal value inputted by the user has a fixed signal value and is wired to a particular location at each multiplexer.

Patentability of Claim 1

Claim 1 recites, *inter alia*:

> a test generating computer (TGC) that generates a test input for self-diagnosis, said test input being inserted between actual safety parameters during normal operation as a test parameter and a test signal position bit indicating position information of the test input....

Keats fails to disclose or suggest a test generating computer that generates a test input for self-diagnosis where the test input is inserted between actual safety parameters during normal operation as a test parameter at a test signal position bit indicating position information of the test input.

As discussed above, Keats teaches a DSS that uses a multiplexer which receives a test signal and multiplexes the test signal. Therefore, Keats can only detect an abnormal signal and cannot identify *which* component is "abnormal." Keats fails to disclose a test generating computer that generates a test input for self-diagnosis. Thus, Keats cannot monitor all of the components of the protection system. Furthermore, Keats teaches a fixed test input signal, i.e., the test signal value inputted by the user has a fixed value.

The present invention, as set forth above, is a system for testing the operation of all of the components of the reactor including the TGC, TAC, VAC and PRC. A test input is inserted between actual safety parameters during normal operation as a test parameter and an abnormal parameter is detected. Therefore, if an actual abnormal parameter is received in the reactor protection system, the parameter can be detected accurately. It is also possible to monitor the state of all of the components as well as all of the types of errors.

A claim is anticipated under 35 U.S.C. § 102 only if each and every element as set forth in the claim is found expressly or inherently described in a single prior art reference and the elements must be arranged as required in the claim. MPEP § 2131.

As discussed above, Keats fails to disclose or suggest that the test generating computer generates a test input for self diagnosis and the test input is inserted between actual safety parameters during normal operation as a test parameter along with the test signal position bit indicating position information of the test input, as also claimed in independent claim 1. At best, Keats *accepts* a hard-wired fixed test input at an input of a multiplexer.

It is therefore, respectfully submitted, that independent claim 1 is not anticipated by Keats because Keats does not disclose or suggest each and every element of claim 1. Accordingly, it is respectfully requested that the rejection under 35 U.S.C. § 102(b) of independent claim 1 be withdrawn.

Patentability of Claim 5

Claim 5 recites, *inter alia*:

> generating, in a test generating computer (TGC), a test input for self diagnosis, said test input being inserted between actual safety parameters during normal operation as a test parameter and a test signal position bit indicating position information of the test input....

As mentioned above with respect to claim 1, Keats fails to disclose, teach or suggest generating, in a test generating computer (TGC), a test input for self diagnosis, the test input being inserted between actual safety parameters during normal operation as a test parameter and a test signal position bit indicating position information of the test input. As mentioned above with respect to claim 1, Keats teaches a DSS that uses a multiplexer which receives a test signal and multiplexes the test signal. Therefore, Keats can only detect an abnormal signal and cannot identify *which* component is "abnormal." Thus, Keats cannot monitor all of the components of the protection system. At best, Keats *accepts* a hard-wired fixed test input at an input of a multiplexer.

It is therefore, respectfully submitted, that independent claim 5 is not anticipated by Keats because Keats does not disclose or suggest each and every element of claim 5. Accordingly, it is respectfully requested that the rejection under 35 U.S.C. § 102(b) of independent claim 5 be withdrawn.

Patentability of Claim 7

Claim 7 is directed to a control program that includes nearly identical steps as set forth above with respect to claim 5. It is therefore, respectfully submitted, that independent claim 7 is not anticipated by Keats because Keats does not disclose or suggest each and every element of claim 7. Accordingly, it is respectfully requested that the rejection under 37 U.S.C. § 102(b) of independent claim 7 be withdrawn.

CONCLUSION

In view of the foregoing Amendments and Remarks, it is respectfully submitted that the present application, including claims 1, 5 and 7, is in condition for allowance and such action is respectfully requested.

Respectfully submitted,

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